

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the matter of )  
Establishment of an Interference Temperature )  
Metric to Quantify and Manage Interference )  
and to Expand Available Unlicensed )  
Operation in Certain Fixed, Mobile and )  
Satellite Frequency Bands )

ET Docket No. 03-237

**COMMENTS OF  
New York State Office for Technology  
Statewide Wireless Network  
State Capitol, ESP  
P.O. Box 2062  
Albany, New York 12220-0062**

April 5, 2004

## Table of Contents

<b>I.</b>	<b>INTRODUCTION .....</b>	<b>3</b>
<b>II.</b>	<b>SUMMARY .....</b>	<b>4</b>
<b>III.</b>	<b>THE COMMISSION SHOULD NOT CHANGE INTERFERENCE ASSESSMENT FROM TRANSMITTER BASED TO AN RF ENVIRONMENT BASED APPROACH.....</b>	<b>7</b>
<b>IV.</b>	<b>INTERFERENCE TEMPERATURE LIMIT WILL NOT BENEFIT LICENSEES.....</b>	<b>9</b>
<b>V.</b>	<b>PROBLEMS WITH THE INTERFERENCE TEMPERATURE METRIC MEASUREMENT GRID CONCEPT .....</b>	<b>17</b>
<b>VI.</b>	<b>BAND SPECIFIC APPLICATIONS OF THE INTERFERENCE TEMPERATURE CONCEPT OR ALTERNATIVE APPROACHES TO SPECTRUM ACCESS MAY BE MORE FEASIBLE.....</b>	<b>18</b>
<b>VII.</b>	<b>PUBLIC SAFETY CANNOT TOLERATE TIME SHARED ACCESS WITH SHARED DEVICES .....</b>	<b>19</b>
<b>VIII.</b>	<b>COORDINATED SPECTRUM ACCESS INITIATIVES MORE FEASIBLE THAN INTERFERENCE TEMPERATURE BASED APPROACH.....</b>	<b>19</b>
<b>IX.</b>	<b>INTRODUCTION OF UNLICENSED DEVICES SHOULD BE DONE IN GREEN SPACE RE-FARMED SPECTRUM THAT INITIALLY TAKE INTERFERENCE TEMPERATURE INTO ACCOUNT.....</b>	<b>20</b>
<b>X.</b>	<b>ESTABLISHMENT OF INTERFERENCE TEMPERATURE LIMITS.....</b>	<b>24</b>
<b>XI.</b>	<b>TECHNIQUES TO MEASURE INTERFERENCE TEMPERATURE LIMIT .....</b>	<b>31</b>
<b>XII.</b>	<b>DETERMINATION OF NOISE FLOOR.....</b>	<b>37</b>
<b>XIII.</b>	<b>INTERFERENCE .....</b>	<b>38</b>
<b>XIV.</b>	<b>CONCLUSIONS.....</b>	<b>41</b>

## **I. INTRODUCTION**

1. The Statewide Wireless Network (SWN), under the New York State Office for Technology (NYS-OFT), offers these comments in response to the Commission's Notice of Inquiry ("NOI") and Notice of Proposed Rule Making ("NPRM") "*Establishment of an Interference Temperature Metric to Quantify and Manage Interference and to Expand Available Unlicensed Operation in Certain Fixed, Mobile and Satellite Frequency Bands*" in ET Docket 03-237, FCC 03-289 (docket), released November 28, 2003. The NOI /NPRM seeks comment on what amounts to a paradigm shift in spectrum management.
2. The New York State Office for Technology, on behalf of the State of New York, is in the process of procuring a new Statewide Wireless Network for State, Federal and Local Governmental entities that operate within New York State's geographic borders. SWN will provide an integrated mobile radio communications network that will be utilized by both the Public Safety and Public Service agencies of New York State. It will provide a digital, trunked architecture and offer both voice and data capabilities. SWN will serve in day-to-day operations, as well as disaster and emergency situations, and will effectively and efficiently coordinate the deployment of all levels of government resources to such incidents. It will also enhance international coordination along the US/Canadian border, and will play a critical role in supporting the homeland defense efforts of the State of New York. Consequently, we feel compelled to contribute our opinion on this issue especially where it may affect Public Safety.

## II. SUMMARY

3. The very first paragraph of the introduction to the docket gave us pause for concern. A wide application of the interference temperature limit across the radio spectrum will prove to be problematic. Various bands exhibit different propagation characteristics, which lead to interference, particularly those from HF through 1 GHz. Present high performance receiver technology strives for high sensitivity and selectivity. High sensitivity implies working at or near the noise floor for a given band. Over this range of frequencies the interference temperature limit (ITL) will raise the noise floor to permit greater opportunity for spectrum access. Raising the noise floor above its ambient level will have an undesired effect on future development of more sensitive receivers.
4. Clearly we should strive for just the opposite. If spectrum is becoming more crowded, we should instead be controlling transmitter radiation and increasing receiver sensitivity/selectivity to enhance spectrum efficiencies (in b/s/Hz). Instead, what appears to be proposed is establishing a threshold to pack more users in a band and in effect creating an interference – limited environment forever. If the Commission is not careful with this approach, the establishment of an ITL could create spectrum issues that will be very difficult to fix.
5. We are also concerned that the Commission is planning to effect a revolutionary change in the way spectrum management is conducted based upon an as yet unproven model. We respectfully urge the Commission not to apply the ITL model to all spectrum – and particularly not to Public Safety spectrum.

6. The Commission is proposing to start this pilot test bed in bands where they believe there is no threat to mission critical communications<sup>1</sup>. However, it should be noted that under Part 101 of the Commission's Rules, Operational Fixed Service licensed stations are used by Public Safety and other mission critical licensees for infrastructure links in the 6525 to 6700 MHz band. Use of this band for unlicensed operations, such as for point to point data links, can subject the licensed operations to interference. Such unlicensed operations have the potential to place their transmitting antennas in the aperture of a licensed station receive antenna, thus negating antenna system isolation. It is not clear how the Commission will monitor and protect the licensed critical infrastructure facilities from unpredictable, unlicensed operation. It is also not clear how the user of the licensed critical infrastructure will recognize whether system trouble is caused by interference, or some form of maintenance problem. Interrupting digital microwave signals cause loss of synchronization and the network and the systems that it links convulse until it resynchronizes.
7. The test bed band should be representative of a typical service. If the ITL works in the test bed bands it *may* be ready for the next step. The ITL should then be studied to determine which bands are most suitable for this type of spectrum management.
8. The State is also concerned with regulatory issues that could arise out of the ITL. The idea of establishing a network of monitoring stations that collect spectrum data, process, and broadcast to subject transmitters<sup>2</sup> may be overly ambitious. Problems relating to operations and maintenance, privacy, or security are enough to question the efficacy of such ideas. Furthermore the infrastructure to support such an endeavor is hard to imagine since it too would need to be ubiquitous in coverage. We understand that such plans are still under

---

<sup>1</sup> Paragraph 31 of the Docket.

development and require further study, testing, and re-testing before they are considered for deployment.

---

<sup>2</sup> Ibid, paragraph 12, page 6.

### **III. THE COMMISSION SHOULD NOT CHANGE INTERFERENCE ASSESSMENT FROM TRANSMITTER BASED TO AN RF ENVIRONMENT BASED APPROACH**

9. The Commission sought comment on whether it would be necessary to shift their current paradigm for assessing interference from a transmitter based to one based on the actual RF environment which includes interaction between transmitters and receivers such as the ITL metric<sup>3</sup>. The State believes the current transmitter based approach for assessing interference, though in need of some improvement, is better than a receiver only ITL based approach. It is very important to remember that many interference problems can be solved through proper coordination, careful planning, and the use of mutually compatible technologies. A main culprit in interference today is the use of incompatible technologies (or emission and receiver characteristics) in a single band - without effective frequency coordination between licensees. For example, in the 806-821 MHz band where the Commission is currently embroiled in the interference to Public Safety from NEXTEL and other cellular systems. NEXTEL and other cellular systems utilize time division multiple access (TDMA) on 25 and 30 kHz channels respectively, while Public Safety and Land mobile radio licensees use frequency division multiple access (FDMA), TDMA, or analog frequency modulation (FM) on 12.5 kHz and 25 kHz channels.
10. With the transmitter interference management approach, the Commission could still lower transmitter power output levels, tighten up out of band emission (OOBE) requirements – including the composite site emission, and at the same time foster development of more sensitive receivers. Controlling transmitter radiation, and employing inter-service frequency

---

<sup>3</sup> Ibid, paragraph 8, page 4.

coordination will solve many of the OOB problems as well as permit greater frequency reuse. We feel the use of antenna technology especially on the base station end of a link to concentrate the signal to specific geographic areas where coverage is necessary will greatly improve frequency re-use and not put signal in areas where service is not required.

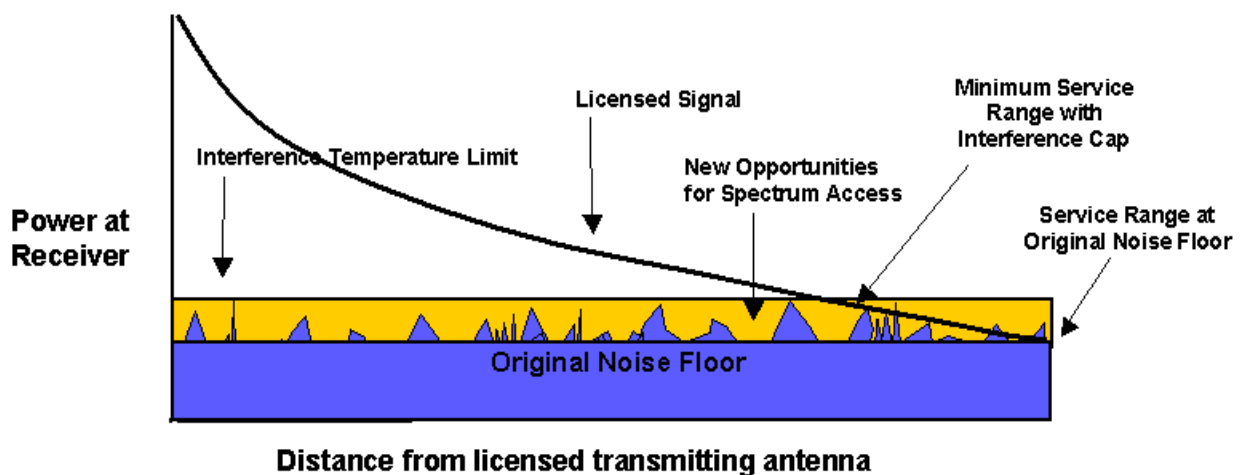
11. The State feels that when faced with the choice between the present approach and the use of an ITL metric; we would choose the former with minor modifications. The current approach with appropriate changes: band plans that reflect technology, and revisions to band plans based upon the state-of-the-art, is far less risky than one based upon an as yet unproven and admittedly revolutionary approach. If the wrong bands are selected for its deployment, e.g., where incompatible technologies (or emission and receiver characteristics) result, we fear the ITL approach would produce another 800 MHz debacle.
12. The Commission believes the new approach would provide incumbents with a greater degree of certainty regarding the RF environment where they operate<sup>4</sup>. We believe this certainty would come at an unacceptable price – the loss of efficiencies in future advances in receiver technology where sensitivity is concerned, and institutionalization of the interference limited design as fact of life via policy. We have been in the past and continue to be opposed to any policy that results in an interference-limited design. The suggestions we offered in paragraph 9 were not to reduce the footprint due to interference but offer an alternative means to utilize available spectrum. The State does not feel it is time to give up on the present methodologies of spectrum management. Change for the sake of change can result in disastrous consequences, whereas change for the sake of improvement will provide long lasting benefits.

---

<sup>4</sup> Ibid, paragraph 15, page 7.

#### IV. INTERFERENCE TEMPERATURE LIMIT WILL NOT BENEFIT LICENSEES

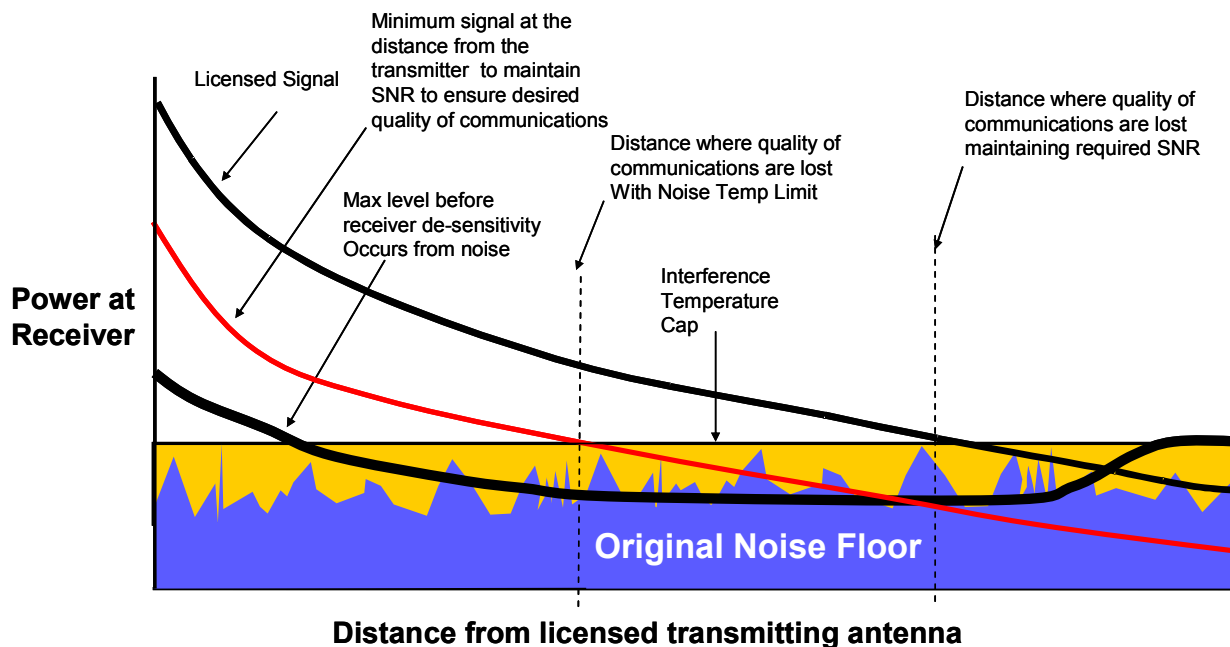
13. In Paragraph 15 the Commission cited the Spectrum Task Force Report's claim that the interference temperature could be beneficial to licensees. We are not convinced this will be the case. The State does not believe the interference temperature limit has been accurately depicted in Figure 1 of the docket<sup>5</sup>. The discussion does not identify whether the frequency under consideration for use by unlicensed devices is applicable both a co-channel and adjacent channel basis. For the sake of discussion, we shall assume co-channel only. Figure 1 as it appears in the docket does not consider the effects of required signal to noise ratios necessary to maintain quality communications, or receiver de-sensitivity. In a real world scenario, it would be impossible for a receiver to provide reliable operation at the noise floor at distances far from the transmitter. Factors such as multipath and lack of signal to noise ratio (SNR) necessary to support reliable communications is lost. Likewise, the signal would not be usable at the minimum service range with the interference temperature cap (ITC) imposed.



<sup>5</sup> Ibid, Paragraph 15, page 7 see Figure 1.

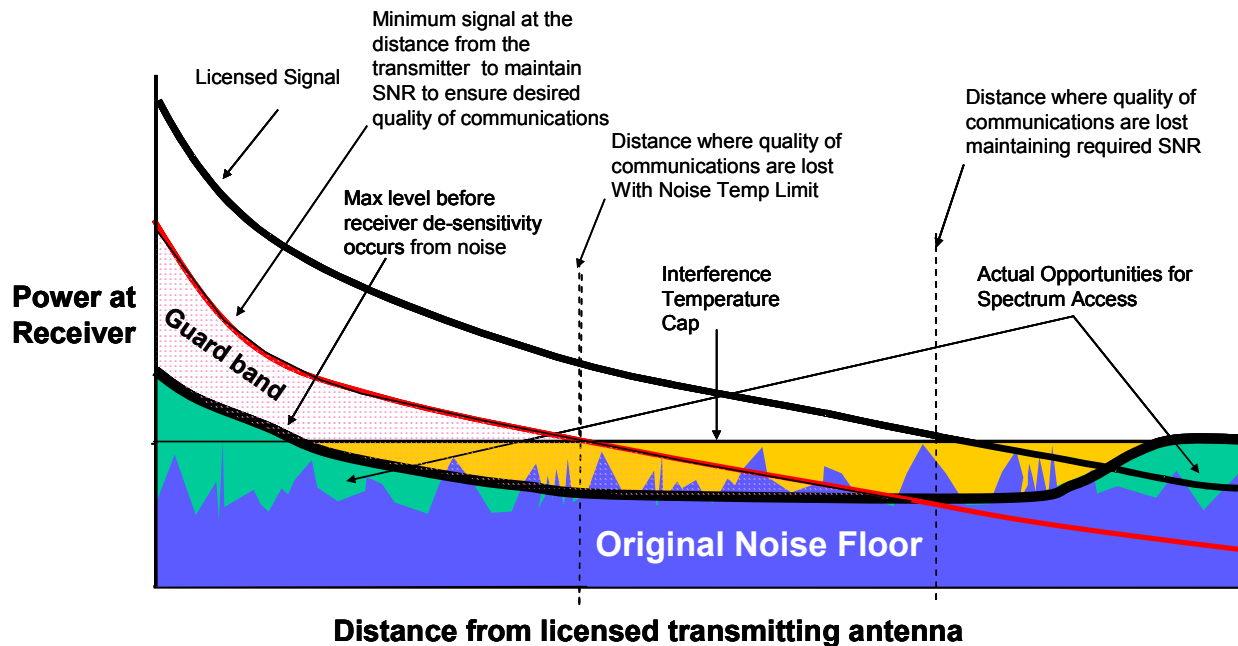
**Figure 1 Original figure from ET 03-327.**

14. When the realities of receiver specifications are included in Figure 1, a totally different picture will begin to emerge. The ITC results in serious implications on the service range of licensed users. The maximum distance in reality a receiver can be from a transmitter is a function of the SNR required to maintain quality communications at a given range assuming no receiver de-sensitivity effects occur. If the ITC is considered, the distance where the communications link will deteriorate is substantially sooner than without the use of the ITC. One curve should have been included identifying the minimum signal at the distance from the transmitter to maintain SNR to ensure desired quality of communications. A second curve should have been included identifying the maximum level before receiver de-sensitivity occurs from noise or co-channel interference.



**Figure 2 Revised Figure 1 with the reality of receiver performance included**

15. The depiction of the original Figure 1 showing the application of the ITC without regard is misleading. When an ITC is incorporated into a band, the service area of the licensed service will be interference limited. This is something we have consistently rejected– the virtual mandate of interference limited designs. This also implies the actual opportunities for spectrum access are much different than the Task Force Report anticipates.
16. A more realistic and workable solution is depicted in Figure 3. To protect the licensed service a guard band should be considered as being the minimum signal at the distance from the transmitter to maintain SNR to ensure desired quality of communications and the maximum level before receiver de-sense occurs. In this region interference from opportunistic devices should be forbidden. The actual areas where new opportunities for spectrum access could be considered to exist are shown in green. These areas are substantially smaller than those depicted in Figure 1 since they now consider the SNR necessary to maintain quality communications and the maximum level where interference would result in receiver de-sensitivity. The actual opportunities for spectrum access only exist close to the transmitter and beyond the distance where quality communications are lost while maintaining the proper SNR. The addition of the ITC does more to prevent opportunities for spectrum access than promote them.



**Figure 3, Location of actual opportunities for spectrum access.**

17. The FCC's Spectrum Policy Task Force (SPTF) had introduced the “interference temperature”<sup>6</sup>, to quantify acceptable levels of interference as a long-term objective. The concept is based upon the premise that the environment is interference limited, with interference pockets distributed in the three primary dimensions (i.e. time, space, and frequency), and would allow operation of unlicensed devices co-channel with Public safety.
18. In general, the concept of interference temperature has received a tremendous response from those providing comment to the SPTF Report. Most of these comments felt that the interference temperature concept is ill conceived, or should not have a place in future spectrum policy. Comments such as these came from many parties including ITA<sup>7</sup>, Agilent<sup>8</sup>,

<sup>6</sup> see SPECTRUM POLICY TASK FORCE REPORT, Federal Communications Commission ET Docket No. 02-135, November 2002 §IX-B-9 (p. 64) and §VI

<sup>7</sup> §III-B (p.10-11), SPTF Report Filing Comments of the Industrial Telecommunications Association, Inc., January 27, 2003

<sup>8</sup> p.6, SPTF Report Filing COMMENTS OF AGILENT TECHNOLOGIES, INC., January 27, 2003

Lucent Technologies<sup>9</sup>, Motorola<sup>10</sup>, CTIA<sup>11</sup>, Lockheed Martin<sup>12</sup>, Cingular<sup>13</sup>, TIA<sup>14</sup> PSWN<sup>15</sup>, and AT&T Wireless<sup>16</sup>, and they are much too voluminous to list here in their entirety.

19. Many Commenters also expressed concern about the logistics of obtaining and applying interference temperature measurements. Agilent notes that *"The interference thermometer concept may prove to be incompatible with some smart-antenna technologies because the radiation pattern cannot be predicted at all points in space in a multipath environment"* and that *"The accuracy of interference metrics, such as interference temperature, should be defined. Greater accuracy may result in more expensive receivers, but lack of accuracy may limit spectrum efficiency...Multipath and flat fading may inherently limit the accuracy of interference thermometers, especially if the interference thermometer does not employ diversity antennas"*. Motorola comments *"... the estimation of the impact of a non-primary user's emissions will be difficult to assess by either the non-primary user or a third-party monitoring network...any interference temperature cap would need to be structured in such a way to minimize the impact on primary users with regard to system deployment, coverage area, information throughput, signal quality, and all aspects of their radio architecture*

---

<sup>9</sup> p.3, Lucent SPTF Report Filing, January 27, 2003

<sup>10</sup> §II-A (p.14), II-C (p.9), and Appendix (p.A-1), SPTF Report COMMENTS OF MOTOROLA, INC., January 27, 2003

<sup>11</sup> §III (p.11), SPTF Report Filing COMMENTS OF THE CELLULAR TELECOMMUNICATIONS AND INTERNET ASSOCIATION, January 27, 2003

<sup>12</sup> §IV (p.8)SPTF Report Filing, COMMENTS OF LOCKHEED MARTIN CORPORATION, January 27, 2003

<sup>13</sup> §II (p.18), II-B (p.24), and II-C (p.28), SPTF Report Filing COMMENTS OF CINGULAR WIRELESS LLC, January 27, 2003

<sup>14</sup> §I (p.3), SPTF Report Filing COMMENTS OF THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION, January 27, 2003

<sup>15</sup> para.14, p.9, SPTF Report Filing, Public Safety Wireless Network , January 27, 2003

<sup>16</sup> §II (p.9), and II-A (p.10), SPTF Report Filing, COMMENTS OF AT&T WIRELESS SERVICES, INC., January 27, 2003

*complexity.*" Given this, the State feels even more certain that the application of an interference temperature metric would be inadvisable.

20. There also has been much concern expressed as to the enforceability of any Policy that utilizes the "interference temperature" concept. Lockheed Martin<sup>17</sup> especially noted this issue, commenting that *"...the proposed interference temperature model raises numerous enforcement concerns..."* and *"the Task Force's proposal avoids the fundamental question of how the Commission will police harmful interference in the context of "interference temperature" ... an underlay scenario raises the questions of how the Commission will identify which transmitters exceed the interference temperature and how these identified transmitters can be compelled to remedy harmful interference. It is unclear that, as a practical matter, an entire category of unlicensed users can be identified and then made to remedy, as a group, the fact that the interference temperature was exceeded. This highlights the fact that the underlay of unlicensed uses does not allow any actual remedial action by the Commission"*. These are very valid points, which again show that the concept of interference temperature should definitely not be an aspect of future spectrum policy.

21. The Task Force also strongly recommends that the Commission migrate to interference-limited policies<sup>18</sup>, where the "interference temperature" concept should form the basis for better defining interference rights<sup>19</sup>. There are many reasons that this trend towards interference-limited policies is harmful to Public Safety allocations:

---

<sup>17</sup> SPTF Report Filing, Lockheed Martin § IV, p.7, January 27, 2003

<sup>18</sup> *Id.* § IX-B-13 (p. 65) and § VI

<sup>19</sup> *Id.* § IX-B-21 (p. 65) and § VI

- These interference-limited designs require higher signal levels in order to provide reliable communications<sup>20</sup>
- These high signal requirements directly reduce the reception range from the transmitter for reliable communications<sup>21</sup>
- This range reduction directly increases the siting requirements and costs of Public Safety systems.<sup>22</sup>
- This siting increase indirectly limits the available capacity for Public Safety systems<sup>23</sup>

22. In fact, there were many Commenters who also felt that either raising the noise floor or increasing interference levels would lead to spectrum waste. CTIA<sup>24</sup> noted that *"...newer technologies...may be more susceptible to noise at a particular threshold, instead of less."* Nokia commented *"Any increase in the noise floor will reduce the overall capacity of the spectrum, even reducing the capacity of the newly introduced device or system that is causing the rise in noise."* Lucent<sup>25</sup> elaborated on this same point, writing, *"Although third generation technologies may better accommodate some types of noise, they are still subject to the adverse impacts of interference...The presence of additional sources of noise, such as that caused by out of band energy from interferers in adjacent spectrum, or from systems*

---

<sup>20</sup> Appendix A-(B), SPTF Report Comments, NYS-OFT, January 27, 2003

<sup>21</sup> *Id.* Appendix A-(C)

<sup>22</sup> *Id.* Appendix A-(D)

<sup>23</sup> *Id.* Appendix A-(E)

<sup>24</sup> §III (p.12), SPTF Report Filing COMMENTS OF THE CELLULAR TELECOMMUNICATIONS AND INTERNET ASSOCIATION, January 27, 2003

<sup>25</sup> p.3-4, SPTF Report Filing of Lucent Technologies, January 27, 2003

*operating in the same spectrum as the victim system, necessarily degrades the signal to noise ratio and impacts the call quality of the victim system. Absent the ability to control the level of such interference within the interfering system, resolution may require action within the victim system, such as a reduction in noise power generated by multiple system users. The effect of external interference may, therefore, result in the need to reduce system capacity. Alternatively, if it is necessary to maintain capacity, the presence of external noise could be accommodated through a reduction in cell coverage*<sup>26</sup>." There are others that note the dangers of interference-limited designs, and the side effects and pitfalls that accompany such operations. ITA<sup>27</sup> writes that *"communications made in a "worst case" or "absolute interference" environment, without the margin for additional random interference, could lead to dangerous situations that jeopardize the safety of the public."* PSWN<sup>28</sup> also expresses concern with regard to increased taxpayer burdens, adding, *"By requiring Public Safety to bid on spectrum or upgrade equipment to met new interference protection standards and increased signal strength requirements, the taxpayer will ultimately have to pay the price in lieu of the private and commercial providers that use the spectrum for profit."* It is clear that generating policy that requires a movement toward interference limited operations is counter-productive in many cases, and dangerous with regards to Public Safety and other mission-critical communications.

---

<sup>26</sup> Lucent also adds that: *"Although a quantitative assessment of the impact of external noise is subject to specific scenarios and system values (e.g., propagation slope, receiver noise figure and sensitivity), the study offers examples, based upon given assumptions, that indicate the impact could be significant. The study suggests that if system capacity is to remain constant, the effect of an external noise power of -109 dBm - equal to the assumed receiver noise floor of -109 dBm - will demand a 30% cell coverage reduction. A second example shows that if the strategy is to maintain cell size, external noise equal to the receiver noise floor of -109 dBm demands a capacity loss of 82%."*

<sup>27</sup> §III -B (p.10) SPTF Report Filing, Comments of the Industrial Telecommunications Association, Inc., January 27, 2003

<sup>28</sup> Summary, p.iii, SPTF Report Filing, Public Safety Wireless Network , January 27, 2003

23. Based upon the concepts presented here, any future migration of Public Safety into interference-limited designs would be both fiscally irresponsible and spectrally wasteful. Public Safety cannot accept the burden of costly policy shifts in a time where it is called upon to do more with less. Furthermore, pushing Public Safety into these types of designs would work against the intent of the policy itself; in other words, spectrum efficiency would be reduced, not enhanced<sup>29</sup>.

## **V. PROBLEMS WITH THE INTERFERENCE TEMPERATURE METRIC MEASUREMENT GRID CONCEPT**

24. The Commission requested comment on whether and how the interference temperature approach could change the current legal framework, regulatory process and general enforcement of rules designed to prevent harmful interference<sup>30</sup>. We feel the idea of the establishment of a ubiquitous monitoring grid to constantly monitor the interference temperature is going to be cost prohibitive and unnecessary. To adequately make such measurements will almost necessarily seem to require the use of tower structures that permit monitoring at different heights above the ground.

25. If monitoring points are only a few feet above the ground, they will not be capable of capturing signals that higher structures would. For example, a base station with an antenna at the 200 ft level would be line of site to low power devices at substantial distances. This would in effect produce a skewed measurement that could prove to be inaccurate. The measurements should be performed at different heights perhaps at intervals of twenty-five feet up to a height capable of seeing the radio horizon.

---

<sup>29</sup> As clearly Illustrated in the Appendices of the previous Comments from NYS-OFT

<sup>30</sup> Ibid, paragraph 17, page 7-8.

## **VI. BAND SPECIFIC APPLICATIONS OF THE INTERFERENCE TEMPERATURE CONCEPT OR ALTERNATIVE APPROACHES TO SPECTRUM ACCESS MAY BE MORE FEASIBLE**

26. IT-based policies essentially mandate interference-limited operations. Interference limited designs are inherently more range limited than noise limited designs. Many public safety operations require long-range ubiquitous communications over large geographic areas which run contrary to an interference limited concept. While it is true that reducing range and employing interference-limited designs increases spectrum re-use for point-to-point data communications, not all information transfer is point-to-point. For example, much of Public Safety's voice communications are point to multipoint, as multiple units need to simultaneously communicate in order to coordinate operations over a particular incident or area.<sup>31</sup>

27. As the docket states, the Spectrum Policy Task Force indicated that the application of an interference temperature in all bands was not feasible<sup>32</sup>. There are many issues that should be considered when entertaining use of an ITC approach at spectrum management, one of which is propagation characteristics. Not all bands are the same. Frequencies below 100 MHz are more prone to atmospheric, ionospheric, tropospheric propagation effects and manmade noise than higher frequency bands. VHF frequencies in the 100 to 170 MHz range offer lower manmade noise but are also prone to propagation anomalies such as ducting across the troposphere and interference from other sources within the band. Perhaps the best

---

<sup>31</sup> See Appendices, FCC Docket 02-135 REPLY COMMENTS OF Statewide Wireless Network, New York State Office for Technology, January 7, 2003

<sup>32</sup> ET 03-237, paragraph 18, "Noting that the Spectrum Task Force indicated that this approach may not be feasible in all bands, commenters are also encouraged to present plans that would tailor interference temperature to specific services. "

frequencies for experimentation lie above 1 GHz. Here, manmade noise is non-existent and propagation is limited to line of site. On rare occasions interference can result from thermal or weather patterns but are generally very well behaved. These frequencies offer the best place to establish test beds to analyze the viability of such theories. The State respectfully urges the Commission to consider exempting frequencies below 1 GHz from application of the interference temperature concept.

## **VII. PUBLIC SAFETY CANNOT TOLERATE TIME SHARED ACCESS WITH SHARED DEVICES**

28. The State strongly opposes any policy that would attempt to time-share Public Safety spectrum with non-Public-Safety or commercial entities. Through the National Public Safety Telecommunications Council (NPSTC), the State is an active participant in the Software-Defined-Radio (SDR) Forum, and as such, tracks the capabilities of current Software Radios, as well as those expected to be available in the near future. Though this involvement, the State notes that the ability to intelligently time-share Public Safety spectrum with other services is not a capability that appears to be practically deployable without some degradation of Public Safety Operations, either in terms of interference, or call blocking. Ideally the availability of Public Safety spectrum could be "locked-out" in times of crisis, but the logistics and practicality of employing such functionality on any scale are as yet unavailable.

## **VIII. COORDINATED SPECTRUM ACCESS INITIATIVES MORE FEASIBLE THAN INTERFERENCE TEMPERATURE BASED APPROACH**

29. Spectrum reserved for Public Safety licensed operations must undergo coordination to ensure they will be able to coexist with neighboring users. If we were to consider the use of shared

devices in Public Safety bands we do not believe the interference temperature metric would be the method to use. Instead, we believe that any users “sharing” would have to be Public Safety users, and such use must be effectively coordinated. We would require that geographical location of these devices be known at all times and be able to passively interact with any technology being used. These devices would in effect have to be part of the system in which they share spectrum. Some necessary attributes would be the ability to monitor control channels, control signaling, channel status, automatic transmitter power control, and knowledge of the location of *all* licensed devices. Under such an approach, spectrum access would be greatly enhanced and protection of incumbents could be maintained - all without the need of an interference cap. This approach seems to be a win-win situation for Public Safety and the Commission; one where additional access to spectrum is obtained and Public Safety is not required to design interference-limited systems. Regulatory issues for shared devices operating in public safety bands could still be the responsibility of the Commission.

30. The State believes such devices could utilize smart radio technologies commonly referred to as those in Cognitive Radio. The use of adaptive radio technology could enable a greater flexibility to Public Safety by maximizing the available spectrum to the greatest extent. We feel spectrum sharing could be deployed much faster and efficiently by coordinated spectrum access than through the use of an interference temperature management approach.

## **IX. INTRODUCTION OF UNLICENSED DEVICES SHOULD BE DONE IN GREEN SPACE RE-FARMED SPECTRUM THAT INITIALLY TAKE INTERFERENCE TEMPERATURE INTO ACCOUNT**

31. The Commission seeks comment on two frequency bands in which it is more feasible for unlicensed devices to be expanded without causing undue interference to the incumbent

licensees. The bands the Commission proposes to use for initial deployment of the interference temperature approach for unlicensed operation is within the FS and FSS uplink band at 6525-6700 MHz and the FS, FSS, and BAS/CARS band at 12.75-13.15 GHz and 13.2125-13.25 GHz<sup>33</sup>. There were a total of four questions the notice of inquiry sought to address. These are covered below:

- a. *Is there is a general metric that can be used to gauge the success of the introduction of the interference temperature devices into a new frequency band?*
  - i. We reply that the success or failure of how well interference temperature devices (ITD) perform will depend upon largely on the band and on the service. The first choice in band selection would be to choose spectrum that is green space (GS) or has just been cleared. If licensed services are to be primary operators on this new GS allocation the Commission will also need to do something that has never done before, put a limit on receiver sensitivity based upon channel bandwidth allocation. This would determine how much sub-space (SS) frequency spectrum is available for underlay devices.
  - ii. Any attempt to mandate interference temperature devices into existing bands with licensed mobile operations would be unfair due to the reduction in coverage that will almost certainly occur by their introduction. Another issue, which is related to this, would be to use a dynamically adjustable interference temperature to control power output and frequency based upon band noise measurements. Incumbents operating in such a band would probably not be in favor of variable coverage effects caused by a fluctuation in the interference temperature. This

---

<sup>33</sup> ET 03-237, Section 35, page 14.

problem would also be troubling in fixed point-to-point links that could suffer outages as a result.

- iii. Therefore, a metric that would be useful in determining success or failure in a case where GS allocations are used would simply be any change in link availability for licensed services. Availability would be defined as the ability to close a communications link while meeting a required Quality of Service (QoS). We would assume interference temperature devices would not be protected. The State believes the best means for success is to “re-farm” existing spectrum by wiping the spectrum slate clean and re-establishing an interference temperature metric.
- iv. The choice of bands the Commission has selected to test the IT concept is unfortunately not a good place to experiment. The 6525-6700 MHz band shares frequencies used by terrestrial point-to-point microwave. This includes broadcast auxiliary<sup>34</sup>, and Private Operational Fixed Microwave<sup>35</sup>. We are disturbed that the Commission has omitted any mention of this critical infrastructure from this proceeding. Consequently, we respectfully urge the Commission to exempt frequencies used in this band that are used in linking our critical national infrastructure vital to public safety.
- v. The Fixed Satellite (FS) service is at most risk from interference to the receive uplink. The space segment uses wider beam patterns which could increase the noise floor substantially due to the area they must service. Therefore, for this

---

<sup>34</sup> Part 74.602 Frequency Assignments 6596.0 MHz with channel bandwidth of 8 MHz.

choice of bands to work, (over the continental United States – CONUS) the interference temperature would need to be set sufficiently low that no interference would occur in the space segment. In order get higher signal level to the satellite to compensate for noise floor increases, higher effective radiated power would be necessary at the earth terminal. This could result in more interference and added costs to modify equipment.

*b. Is there a simple metric that can be used to gauge the effect of these unlicensed devices upon the incumbent services?*

- i. The best gauge in determining the effect of unlicensed devices on incumbents could be realized by link availability as stated above which affect quality of communications. If the reliability of a radio communications link is compromised availability is degraded. When this occurs the information path is for all practical purposes broken. We believe this is the defining parameter. Since the antenna pattern of the space segment must cover a large geographical (CONUS) area there may be a marked increase in the cumulative noise floor. Since the area is sufficiently large, to prevent a marked increase in noise floor at the receiver the ITL will need to be set extremely low.

*c. Should the introduction of interference temperature devices be done in stages to ensure that the incumbent services do not suffer undue interference?*

- i. If the band designated for introduction of ITDs is not a newly re-farmed band users will suffer performance degradation. We suggest that the interference

---

<sup>35</sup> Part 101.147 Frequency Assignments in 6,525–6,875 MHz are shared with stations in the fixed-satellite and private operational fixed point-to-point microwave services.

temperature level must first be established to enable new licensed services to design systems based upon the new constraints. With such a deployment scenario ITDs could be introduced at any time. Once the ITL has been reached no more ITDs should be introduced. Continuously raising the ITL to accommodate more users is unfair to incumbents.

*d. If the introduction were to be done in stages how should we limit the initial introduction of interference temperature devices to protect the incumbent systems?*

- i. The State feels that the introduction of ITDs in existing bands that have not been re-farmed for their use should not be attempted. The increase in the noise floor that would result would be detrimental to the operation of incumbent services. We feel ITDs should only be introduced in bands where the users understand there is a reasonable expectation that interference will occur in their band. To do otherwise would be treating incumbents as secondary users of the spectrum. We wonder if the Commission has consulted with the incumbents of the test bed bands and asked them if they can conduct operations under a reasonable expectation to experience greater interference.

## **X. ESTABLISHMENT OF INTERFERENCE TEMPERATURE LIMITS**

33. The Commission seeks comment on what technological factors should be considered in setting interference temperature limits<sup>36</sup>. The Commission submits that the users would prefer a low limit while vendors of unlicensed devices prefer higher limits. Our reply on this issue is provided below.

---

<sup>36</sup> Ibid, Section 21, page 9.

a. *What elements should the Commission consider in setting temperature limits for different bands and locations? The Task Force suggested that some of the factors to be considered in setting temperature limits for a band include: 1) the extent of current use; 2) the types of services being offered; 3) the types of licensees (for example, Public Safety); 4) the criticality of services and their susceptibility to interference; 5) the state of development of technology; and 6) the propagation characteristics of the band. We request comment on whether these factors are appropriate as well as whether other criteria also should be addressed.*

i. Interference temperature is expected to vary between rural, urban, and heavy metropolitan environments. In some of these areas it is possible to have a departure from the norm. There will undoubtedly be significant increases due to close proximity to an “antenna farm” where a large number of transmit sites are clustered together. Antenna clusters can occur in urban and rural environments making generalized measurements impractical. There are many variables present that can make a general characterization difficult. For this reason, the measurement grid will need to be dense in order to generate the most accurate assessment of the ambient noise floor. Simply taking a few points in a city and one or two in the country over a county wide area will not be sufficient.

ii. There may be times when no spectrum is available since all of it has been licensed. In such situations there may be sufficient amount of time where no transmissions occur. During these times spectrum is potentially available for use. However, the devices that will share spectrum will need to be intelligent

enough to not cause interference to licensed services. Perhaps listen before talk technologies will need to be capable of listening while talking, or a form of “pre-cognition”. We feel this is easily accomplished by short operation duration and a longer listening duration. This will provide a statistically lower possibility of causing interference. However even with these techniques the possibility exists to corrupt transmissions which can reduce performance of licensed services due to the decreased signal to noise ratio caused by the sharing devices. Due to the large number of variables that can exist, we feel the use of interference temperature devices will result in a degradation of link availability to primary services. Therefore, their use will be detrimental to any band where they are secondary users. The remedy to reduced communications distance is shorter siting distance. With the problems being experienced in tower siting, this seems to be counterproductive.

- iii. It is not clear that there is any practical way for a device to continuously monitor the interference temperature of its environment while transmitting. One would think the radiated power as well as reflections from near scatterers will mask other possible sources that will contribute to overall interference temperature.
- iv. Each band will exhibit different propagation characteristics. For this reason excluding frequencies below 1 GHz as bands that can use the interference temperature metric seems logical. Likewise we believe that Public Safety bands should be exempt from the interference temperature concept. If sharing

opportunities were desired in Public Safety bands it should only be permitted on a coordinated basis.

*b. In addition, Commenters should address what, if any, technical factors (e.g., power, field strength at boundary areas, antenna requirements, etc.) should be considered in determining the interference temperature limits for a given service, frequency band and geographic area.*

- i. All of the above mentioned technical factors are novel and practical ideas. The question of the cost effective incorporation of this technology into consumer or commercial equipment will depend upon the market they serve. The State also believes these ideas should remain the responsibility of private enterprise and not the Commission.

*c. Should factors not specified by the Commission's rules, such as typical modulation types for a given service, be considered? If so, Commenters should identify these factors and the rationale for including them.*

- i. The use of disparate modulations in a common band should always be considered when trying to reduce interference potential. The current push to have NEXTEL move from 800 MHz frequencies to eliminate interference to Public Safety is a classic example. NEXTEL uses Time Division Multiple Access (TDMA) and Public Safety predominantly uses analog and digital frequency division multiple access (FDMA). Use of these two modulations in the same band plan can be perilous without coordination. Likewise we feel care is necessary not to mix different technologies. The choice in modulation

should be considered to prevent the greatest possible resistance to interference that may result from incorporating interference temperature devices in a band.

- ii. To mitigate the effects of different technologies the State suggests a greater reliance and use of coordination. Both frequency and technology compatibility must be considered. Lastly, coordination should consider geographic service areas, and encourage the use of directional antennas to contain RF energy to only the areas where it is required.

*d. How should the factors identified be used to determine interference temperature limits?*

*That is, should each factor be considered equally or is some more important than others?*

*Can an equation be developed that uses the identified factors to calculate a temperature?*

- i. Obtaining useful interference temperature measurements may be problematic. The environment is at a minimum 5 dimensional, with characterization required for time, space (X, Y and Z), and frequency. During the measurement period there will be transceivers affecting all of these dimensions, and there is no guarantee that either the configuration or mobility of these transceivers is repeatable or predictable. In no sense can this environment be considered stationary for purposes of policy-based characterization.
- ii. The factors that should be used in setting the interference temperature limit (ITL) in any given band should consider the criticality of the traffic, and the availability requirements for the services utilizing the band. The nature of the service dictates a reasonable expectation of encountering interference – such

as the Industrial Scientific and Medical (ISM) bands. Therefore, it is logical in these bands the impact of an interference temperature device may not be noticeable.

iii. In bands where critical communications exist such as Public Safety for example, the Commission should not utilize an interference temperature. Instead, the State believes if devices are permitted on a secondary basis that they be coordinated and of the same service. Consequently, the State does not believe an equation can accurately capture the realities of actual empirical data. Furthermore, we feel a one size fits all approach is simplistic at best and will aid some and penalize others.

*e. In bands where several services share the spectrum on a primary or secondary basis, should the interference temperature limit be based on all the licensed services or only on the service most susceptible to interference? How would this be determined? Is the I+N of a primary service meaningful to a secondary service?*

i. The State feels this approach will result in a band that is not very useful due to the high interference that will result from primary, secondary, or shared services.

*f. Are there minimum receiver performance criteria that should be considered as a reference in setting interference temperature limits? If so, how should the specifications for such a reference receiver be developed? Or should the Commission use the worst receiver available for a service, or an average receiver, in determining temperature limits? How would such a receiver be identified?*

- i. The State is concerned that ITLs will result in lower performance receivers.

This is based upon the premise that if a receiver is only required to operate down to a specified noise floor, the sensitivity can be reduced. Selectivity should still be high in any receiver of modest performance, however there is a possibility that this too could suffer as a result.

- ii. The State also feels these performance criteria should not be made part of the rules. If they were to be incorporated into the rules, we believe technology development would be stifled and performance would suffer. Receiver performance should remain the domain of private industry in order to foster competition, push the state-of-the-art in the development of higher performance receivers and not retard it.

*g. Should the Commission allow private agreements between licensed and unlicensed users to set interference temperature limits for specific bands and frequencies? If so, are there incentives the Commission could/should provide to licensees to increase the temperature limit over that set by the Commission?*

- i. The State is concerned that such agreements may circumvent the Commission's authority to regulate spectrum and radio communications. We also believe that Commission should not relinquish its authority for the promise of self-regulation. The state is also concerned the resolution of interference disputes without the intervention of the Commission will drive increased litigation.

*h. How often should interference temperature limits be reviewed?*

- i. The State is concerned once the ITL is set, subsequent attempts to modify it may prove to be a challenge. We are also concerned that if the task becomes overwhelming and programs are faced with budgetary cuts, the entire process of review could be compromised if not abandoned. No discussion has precipitated on this regard as to the longevity of such a plan. The Commission has never stated how the interference temperature based paradigm would be recalled if it was proven to be a failure, which is something that concerns us.

*i. Are there some services or bands for which the Commission should continue to use the current interference protection procedures?*

- i. The State believes all bands that are directly or indirectly used for public service, Public Safety, and scientific research should be exempted from the interference temperature limit. We feel current protection afforded to these services should remain intact. Likewise we feel all bands below 1 GHz should be exempt from the ITL.

## **XI. TECHNIQUES TO MEASURE INTERFERENCE TEMPERATURE LIMIT**

34. The Commission also requested comment on the approaches to be used for measuring interference temperature on a real-time basis and, in the case of temperatures derived from measurements at multiple sites, communicating that information to devices that are required to protect the limit<sup>37</sup>. Our responses to these questions are given below:

---

<sup>37</sup> Ibid, Section 22, page 10.

a. *How should the Commission decide on the type of interference temperature monitoring to be required to provide real-time interference control? Commenters should identify the costs and benefits of the three monitoring approaches discussed above and how they relate to different services. Commenters are also encouraged to identify other monitoring approaches.*

- i. In order for the Commission to monitor and provide real-time interference control sites would have to be everywhere – ubiquitous. We do not believe this to be at all practical or realistic. Likewise the cost and complexity of maintaining such a network could be staggering. The State urges the Commission to abandon this type of approach and instead utilize device centric technology to perform autonomous real-time control of devices utilizing the ITL.
- ii. Furthermore to accurately model the noise floor at any given site would require towers tall enough to make measurement possible at different heights. This being said, we do not think it will prove practical let alone possible to construct such a network. The antenna network required may also prove prohibitive since measurements should be performed across a continuous spectrum.
- iii. Finally, to produce results of necessary integrity, there will be a need to collect a large quantity of data over a substantial period of time in order to ensure repeatability. Measurements would almost certainly need to be performed 24 hours per day, 365 days per year, perhaps for a number of years.

iv. We are not trying to discourage the Commission from conducting a measurement of the noise floor. On the contrary we are considering the potentially large scope of such an undertaking. The usefulness of such data would be invaluable to system designers and planners. We urge the Commission to consider doing something even if it is substantially scaled back. The State suggests taking measurements over a number of different urban and rural scenarios to generate a baseline to work from.

*b. Should certain monitoring schemes be specified for certain services? Or should this be solely up to the incumbent licensees?*

i. We are puzzled at what the Commission is asking in this question. What seems to be stated is a reversal to wide-area monitoring. Likewise, we feel incumbent licensees are not the ones who should be monitoring since they would for all practical purposes lack any statutory authority to act on resolving interference issues.

ii. The monitoring schemes should consider the channel plan, channel bandwidth, and emissions used by a service. In addition to these factors, the frequency utilized and the patterns of operation will likewise dictate how monitoring is performed.

*c. How would monitoring systems be funded and who would be responsible for their establishment, operation, and maintenance? Commenters should consider vendors or operators of unlicensed devices and network services, users of such equipment and services, and perhaps licensees.*

- i. The monitoring effort should be spread out over the country to develop a representative assessment of the noise floor. Federal funding would be logical. The Commission should dictate standardized approaches to be followed for data collection.

*d. What principles/criteria would be used to choose the location of monitoring sites?*

- i. Monitoring sites should provide measurement data for rural and urban areas. These sites should be chosen on a grid and spaced as evenly as possible. The spacing between sites will depend upon the frequency where noise measurements are taken. Since path loss is higher at higher frequencies spacing will need to be chosen to provide adequate measurement density. If insufficient siting is performed, an inaccurate representation of the noise floor could result where some services could be subject to harmful interference while measurements suggest the opposite.
- ii. Antennas used in performing measurements should be omni directional, placed at ground level, and at increments of 50 feet up to 200 feet in height. The State feels there will be a noticeable difference in noise floor measurements that varies with height above ground. Measurements should also be conducted on towers of substantial height (200 to 1000 ft). These sites will be susceptible to interference that shorter towers will not experience. This is manifest from interference complaints between far stations operating within the rules and well outside of each other's contours.

- iii. All monitoring site tower structures should be constructed such that identical building materials are used in essential areas that could affect data collection. All measurement locations should also utilize the same receivers and ancillary hardware. Antennas used at all sites should be of the same electrical properties – gain, bandwidth, and beamwidth. The antennas too must be fully characterized across the bands where noise measurements are conducted.
- iv. Any measurement system used for conducting noise floor measurements should be capable of a sensitivity better than 20 dB below  $kTB$ <sup>38</sup>. This will require knowledge of the noise contribution from all components in the system over the frequency range where measurement are conducted. This should include all components such as coaxial cable, filters, etc. All equipment should be calibrated and with traceability to NIST.

*e. How often should the spectrum be monitored? How large a band should be monitored? How should monitoring differ with the type of incumbent services present in a band? What bandwidth should be used for monitoring (e.g., should measurements be taken with a resolution bandwidth of 1 megahertz)?*

- i. The spectrum should be monitored continuously over the course of a number of years. Together with the collection period the makeup of the band should be monitored as well but in a different way. The band makeup must monitor the technologies deployed. Modulations used by services in a band under investigation will determine if a technology is truly spectrally efficient – while

---

<sup>38</sup> Where B is set but the minimum bandwidth of the primary service in the band

not causing spectrum pollution. Also monitoring technologies will provide insight into how the noise floor is influenced.

ii. We would suggest that the bandwidth used for monitoring be related to the service and band requirements as defined in the rules. Using the same bandwidth as the existing channel plans in a given service would provide data of the noise contribution to a system.

iii. The State suggests the resolution bandwidth should be minimized to provide the greatest sensitivity to signals. To further increase the sensitivity we recommend the use of video averaging and video filtering.

*f. What detection functions, e.g., root mean squared (RMS), peak or average, should be applied in performing noise measurements? What integration or averaging time should be employed with these measurements? What measurement bandwidths are appropriate?*

i. The State prefers the use of video averaging because it will provide results that are the most accurate representation of the true average. Averaging should be set to the highest number of sweeps<sup>39</sup>.

*g. How would the information from monitoring sites be used to determine real-time interference temperature values for a specific band in a given geographic area and whether established limits were exceeded?*

i. There are various ways real time data could be used to control the deployment of interference temperature devices. First, in the geographic region where

---

<sup>39</sup> See Hewlet Packard Application Note 150 Spectrum Analyzer Basics, page 17-18, November 1, 1989.

limits have been exceeded the Commission could convey regional prohibitions to manufactures of IT devices. Devices therefore should have some geo spatial capability (GPS) to identify the region where they have not been authorized to operate. A means to permit a device to reactivate once the IT level returns to the established limit should also be incorporated. Second, the Commission could impose an over the air code to be issued by licensees to deactivate/reactivate IT devices once the limits have been exceeded.

*h. What spectrum resources should be used to convey monitored temperature information to devices subject to temperature limits? Should dedicated frequencies be used for this purpose?*

i. The State is in favor of dedicated frequencies for conveying monitored information to licensees and not to devices. The State suggests discrete frequencies are monitored based upon bandwidth allocations defined in the rules. These would provide data that can be mapped to licensees' equipment to provide an accurate means of judging performance effects from IT devices. The use of over the air signaling to deactivate/activate IT devices could utilize this data if limits were exceeded.

## **XII. DETERMINATION OF NOISE FLOOR**

35. The Commission also requested on how to define the noise floor and whether there are considerations that would justify using slightly different definitions for different bands and/or services. They also request comment, information, and research on the levels of the noise

floor in the various frequency bands and how those levels vary over time and across geographic regions<sup>40</sup>. Our replies are given below.

- a. The State favors a definition of the noise floor that is based upon the ambient noise present over a given frequency range. We believe alternative definitions will result in alternate interpretations of interference and ultimately impact the rules.

### **XIII. INTERFERENCE**

36. The Commission also seeks comment on interference potential. Our comments are below<sup>41</sup>.

- a. *For a given service in a given frequency band, how much interference can be tolerated before it is considered harmful? If the determination of harmful interference would be based on specific quality of service levels, we request comment on the rationale used to justify the recommended constraints. The commenting parties should note the specific frequency bands and services to which their comments apply.*
  - i. The amount of interference that can be tolerated will depend upon the level of performance a service requires. For example, Public Safety requires systems be capable of good audio quality. For digital systems this translates to a high delivered audio quality (DAQ) of anywhere between 3.0-3.4. Analog radio communications require audio to be of high fidelity, which is usually defined as circuit merit. Data communications for Public Safety operations requires low BER to ensure high performance and support maximum throughput for many users.

---

<sup>40</sup> Ibid, Section 26, page 11.

<sup>41</sup> Ibid, Section 28, page 12.

- ii. Any band used by Public Safety and for operations supporting critical communications will have a very low interference threshold. The same could be said for any frequency even used for cellular or satellite communications. A good example could be the use of a cell phone in an emergency or a call from an OnStar customer from their automobile. Most spectrum, even our AM or FM broadcast should be considered as well. In times of natural or manmade disasters, citizens look to their local AM/FM or TV stations for news and information.
- b. Should the interference temperature limit be set at level that quantifies “harmful interference” or some other benchmark, or “safe-harbor” level that would constitute less than harmful interference?*
- i. The State feels that the ITL should be set far below what is called “harmful interference” levels. There should be some interference guard band established to protect licensed services. The entire premise of the ITL appears to be in order to create more opportunities to access spectrum, but licensees must suffer performance reduction.
  - ii. On the contrary we believe the interference temperature limit needs to be set very low. This should be dictated by the current state of the art in receiver technology. Should receivers be capable of providing usable communications – good audio quality or low bit-error-rate (BER), with a median desired signal level as low as – 110 dBm (for example), then that should set the ITL at least 40 dB below that<sup>42</sup>. If the ITL is raised, the end result will be receiver performance innovation for all

---

<sup>42</sup> This 40 dB includes the median S/(I+N) necessary to support a given data rate or voice quality, as well as a 20 dB margin to provide reliable operations in a fading environment.

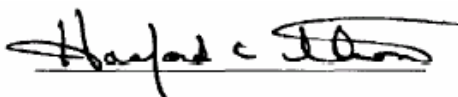
practical purposes would be unnecessary. Therefore, any attempt to drive the noise floor up that stifles innovation is something we cannot support.

## **XIV. CONCLUSIONS**

37. After reading through this docket and responding to a myriad of questions, the State does not believe the interference temperature metric is mature enough to merit deployment. The State is not convinced the use of interference temperature will permit greater opportunity for spectrum access and consequently requires further analysis. We also believe it is not the only way to realize this goal. Based upon the questions the inquiry posed we do not believe there will be a practical means to regulate the bands where the ITL is deployed. The fact that the noise floor will increase in a band where ITL is imposed can have a detrimental effect on future development of high performance receiver technology. If a receiver is only required to operate down to a certain level - higher than it is today, there is technically no incentive to build highly sensitive receivers.
38. We feel the best hope for providing a greater opportunity for spectrum access will be one in which interference is kept to a minimum and the noise floor is not increased. The State believes Public Safety bands can provide other Public Safety users greater access and interference protection by using a combination of coordination and smart radio technologies.
39. The State feels that to experiment with such an approach can only logically and fairly be done in a band that is pristine. This would require re-farming of existing bands creating green space void of man-made interference. The best place where the interference temperature approach can be successfully applied is on frequencies in the GHz range where man-made noise is non-existent. Devices would typically be short range and not prone to atmospheric abnormalities which tend to cause interference.

40. The State respectfully urges the Commission to exclude frequencies used by terrestrial services in 6525-6700 MHz band from the interference temperature limit. Terrestrial point-to-point services in this band are critical to the national infrastructure.
41. We also respectfully urge the Commission to exclude all operations below 1 GHz from the interference temperature concept. We feel the only place where this approach should be studied is at higher frequencies where tighter control can be exercised on devices that may utilize these techniques. We feel their use in other lower bands will create regulatory issues that we may not be able to control or reverse.
42. In closing, the State commends the Commission for looking at bold new approaches at promoting greater opportunities for spectrum access. We feel the interference temperature concept will not meet the Commissions expectations in achieving their desired goal of greater opportunities to spectrum access. Because of the boldness of this approach, we feel more study and years of validation will be necessary before feasibility let alone widespread deployment can be given consideration.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "Hanford C. Thomas", written over a horizontal line.

Hanford C. Thomas  
Director - Statewide Wireless Network  
New York State Office for Technology  
State Capital ESP, PO Box 2062  
Albany, New York 12220-0062  
(518) 443-2041